



# **OPTex® Series Laser Device**

## **Training Documentation**

# OPTex® Series Excimer Laser





# Lambda Excimer Lasers: Product Range

- OPTex
- COMPex 100 Series; 200 Series  
150 Series
- LPX® 200i Series; 300i Series
- LPF 200 Series
- LAMBDA Steel LS 670; LS 1000
- FIBex
- NovaLine 50 Series; 100 Series  
Litho Series

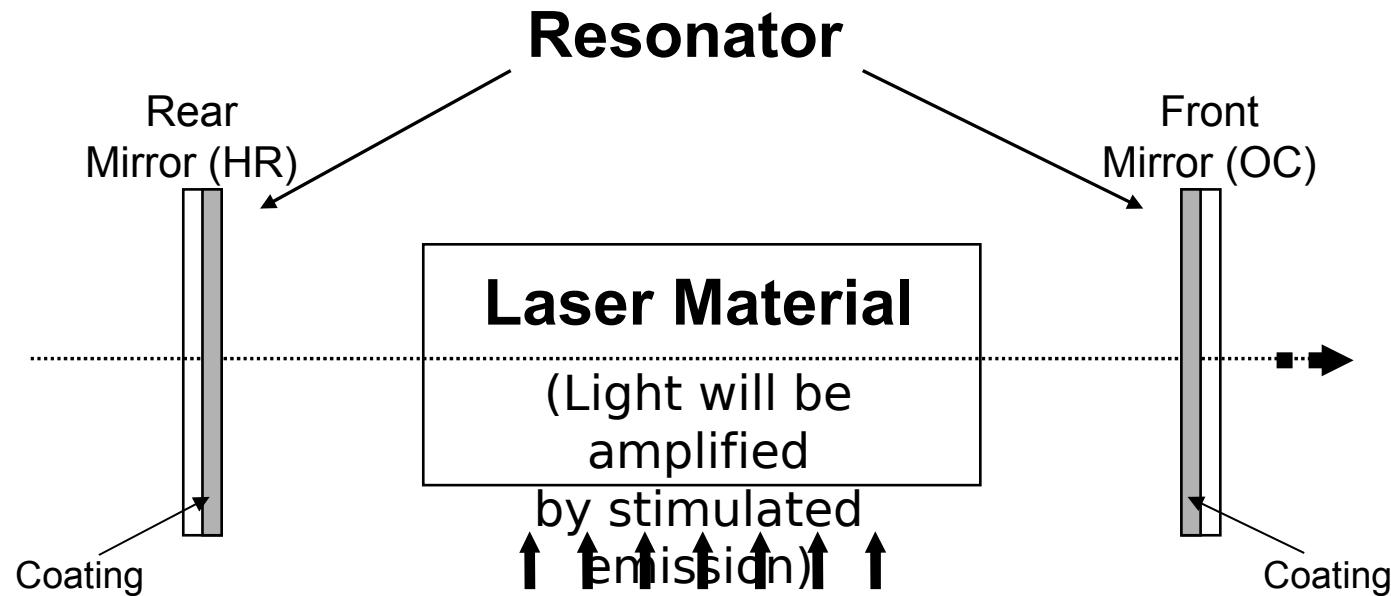
# L. A. S. E. R.

- **Light**
- **Amplification By**
- **Stimulated**
- **Emission Of**
- **Radiation**
  
- (Lichtverstärkung durch stimulierte Strahlungsemission)

# What is a Laser?

- **Monochromatic light**
- **Low divergence**
- **Coherent light**
- **Light with high intensity**

# Laser Principle

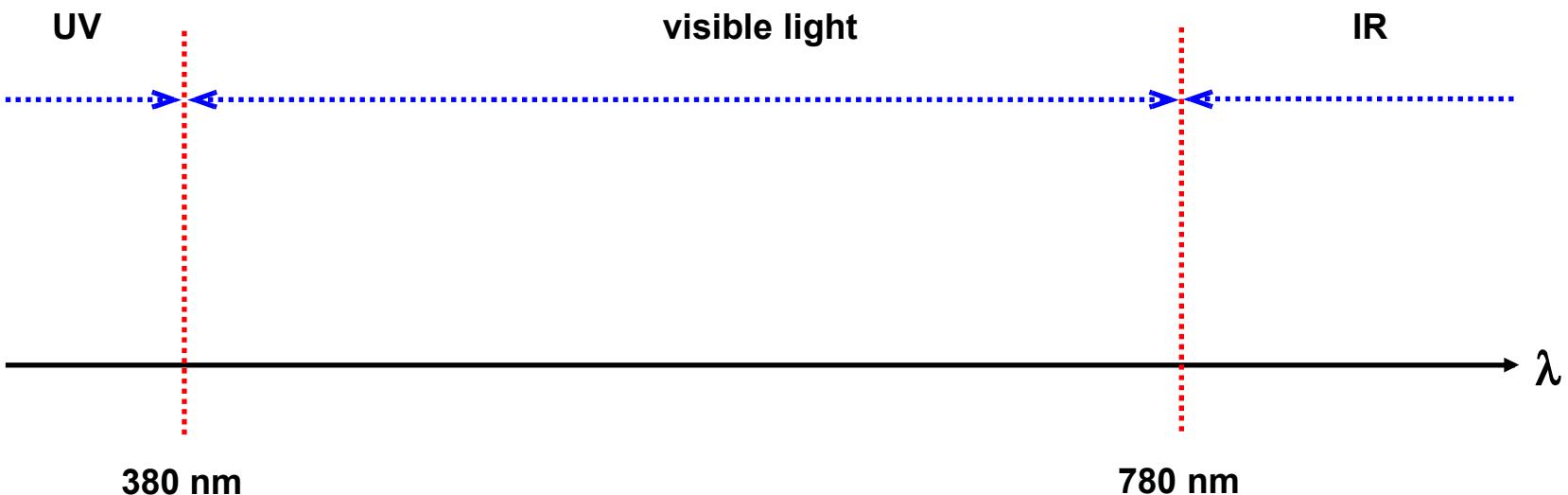


**Supply of energy  
by the pump source**

# Types of Lasers

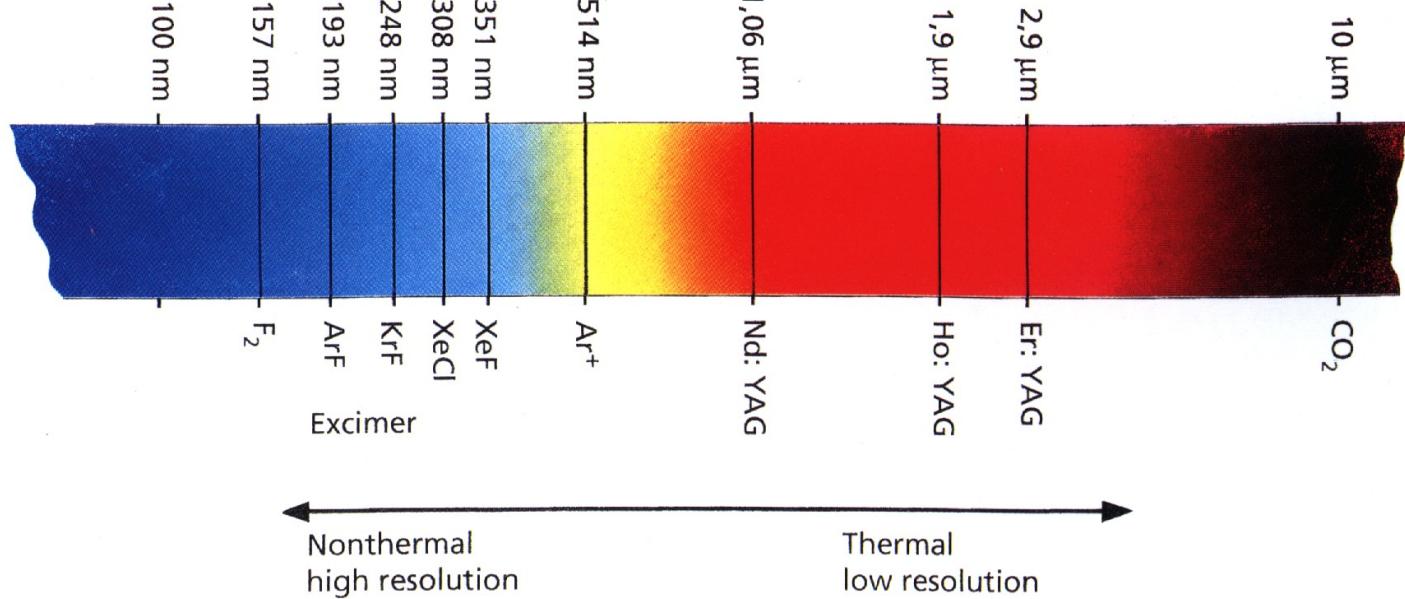
- All Solid State Lasers ( Festkörperlaser )
  - Nd:Yag Laser
- Gas Lasers ( Gaslaser )
  - Excimer Laser
  - HeNe Laser
- Dye Lasers ( Farbstofflaser )
- Semiconductor Lasers ( Halbleiterlaser )

# Unit Indicator

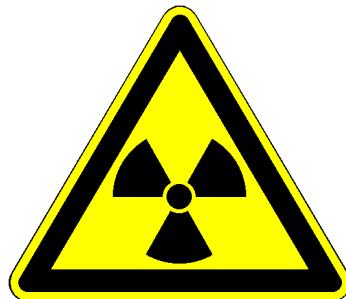
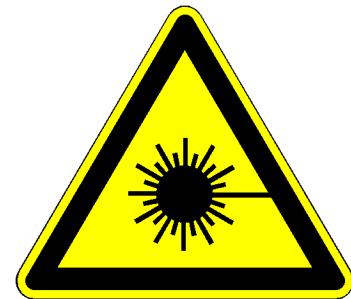
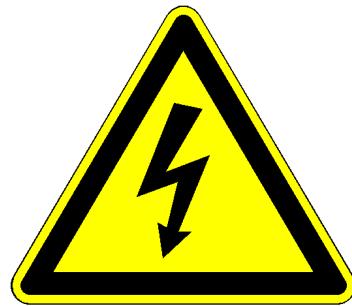


1 mm	= 0,001 m	= $10^{-3}$ m
1 $\mu$ m	= 0,000001 m	= $10^{-6}$ m
1 nm	= 0,000000001 m	= $10^{-9}$ m
1 pm	= 0,00000000001 m	= $10^{-12}$ m

# Unit Indicator



# Laser Safety Aspects



# Excimer Laser

- EXCIMER

**EXCIted DiMER**

- RARE gases

Ar  
Kr  
Xe

- HALOGEN gases

HCl  
F2

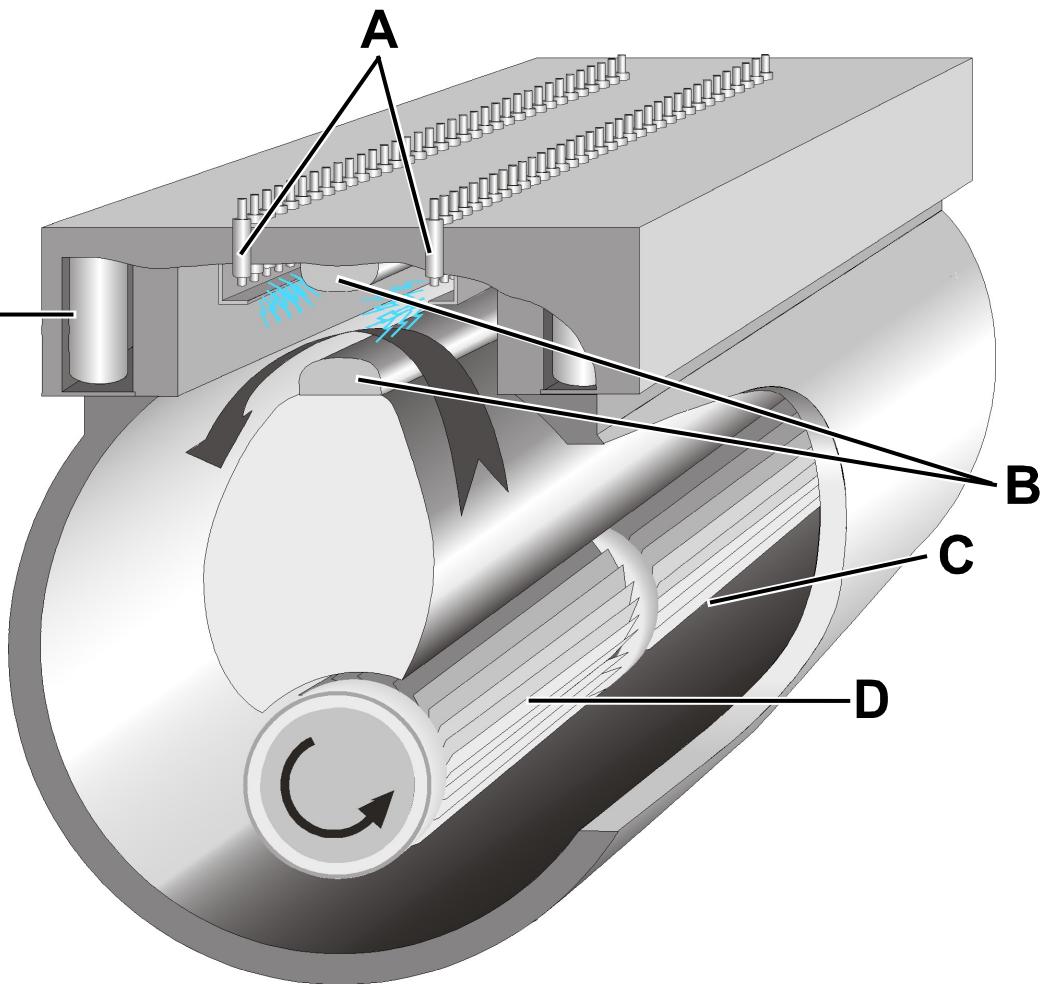
- BUFFER gas

Ne

- INERT gas

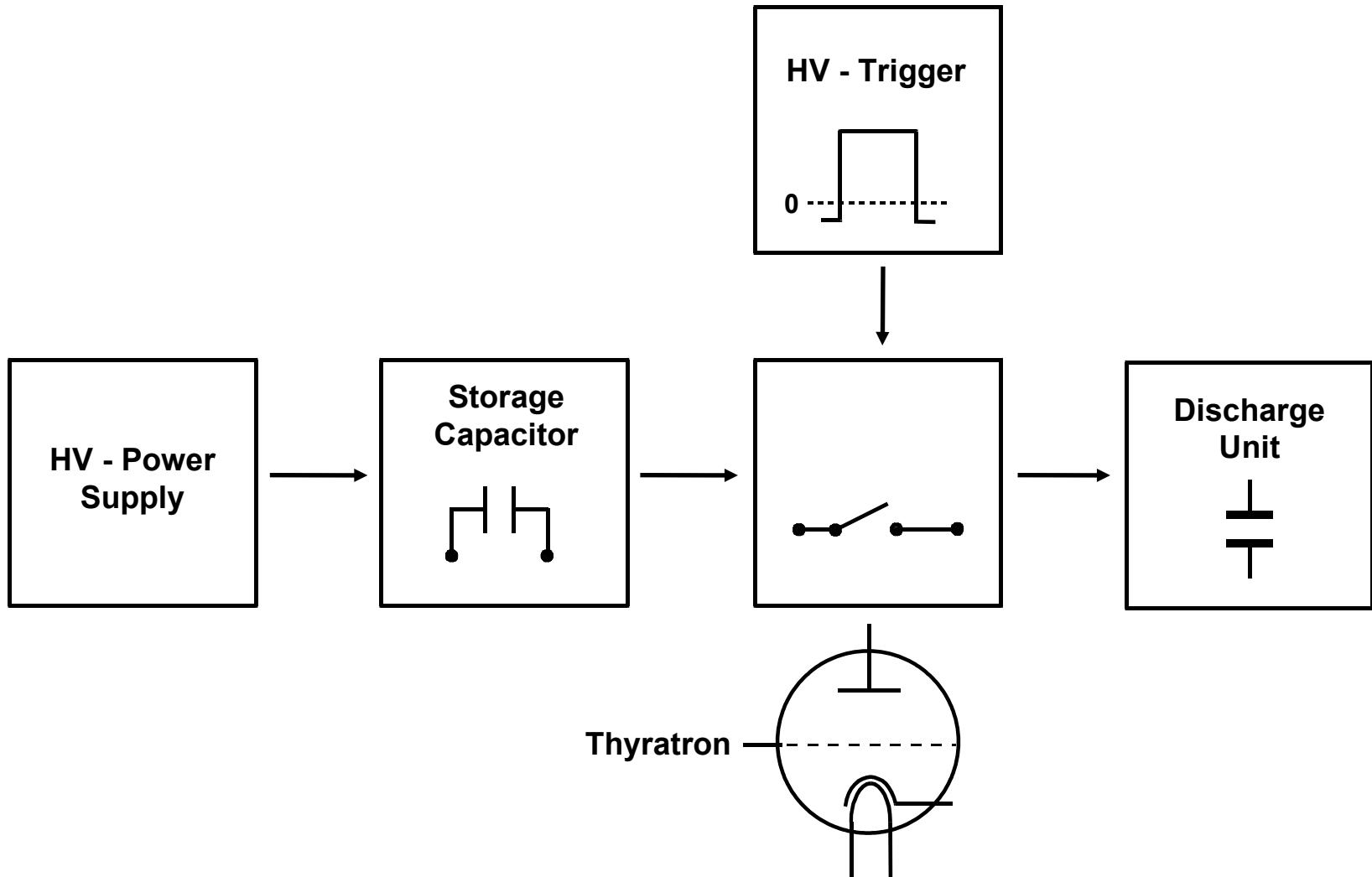
He

# NovaTube Design



- A Preionization Electrodes**
- B Main Electrodes**
- C Gas Reservoir**
- D Gas Circulation Fan**
- E Discharge Capacitors**

# Simple Block Diagram HV-Circuit

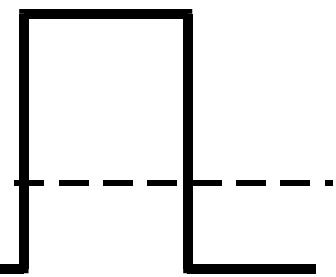


# Principle of a Thyratron

Trigger up to 1kV

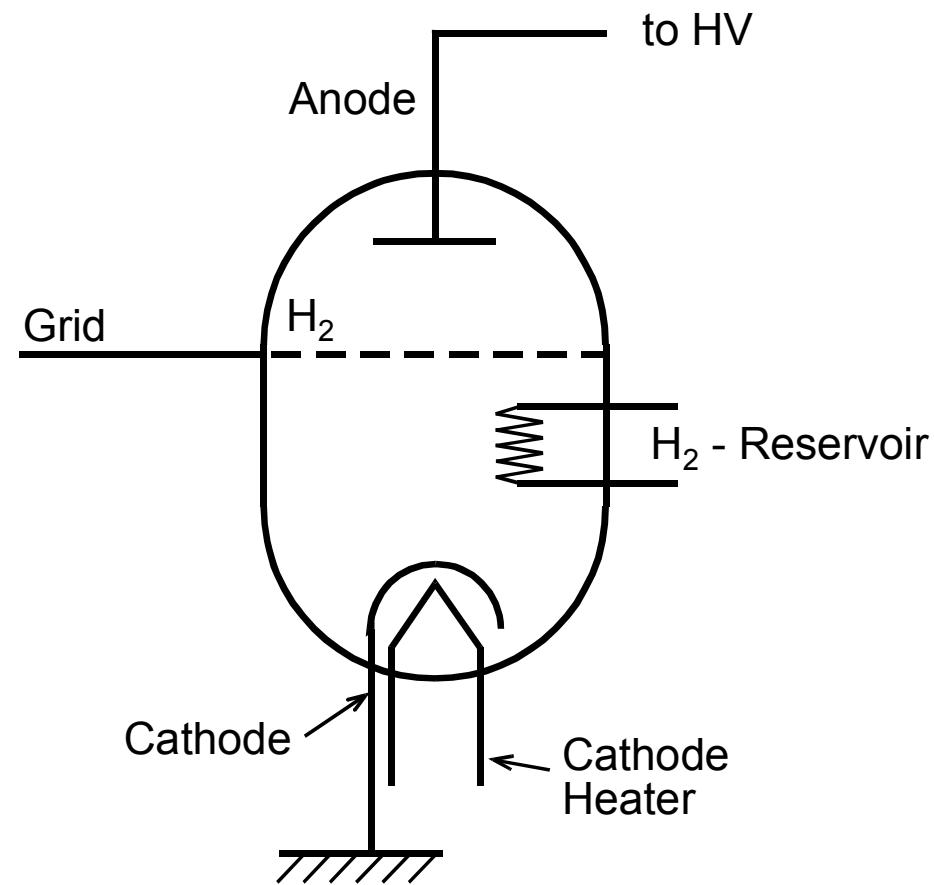
Ground 0V

Bias -150V

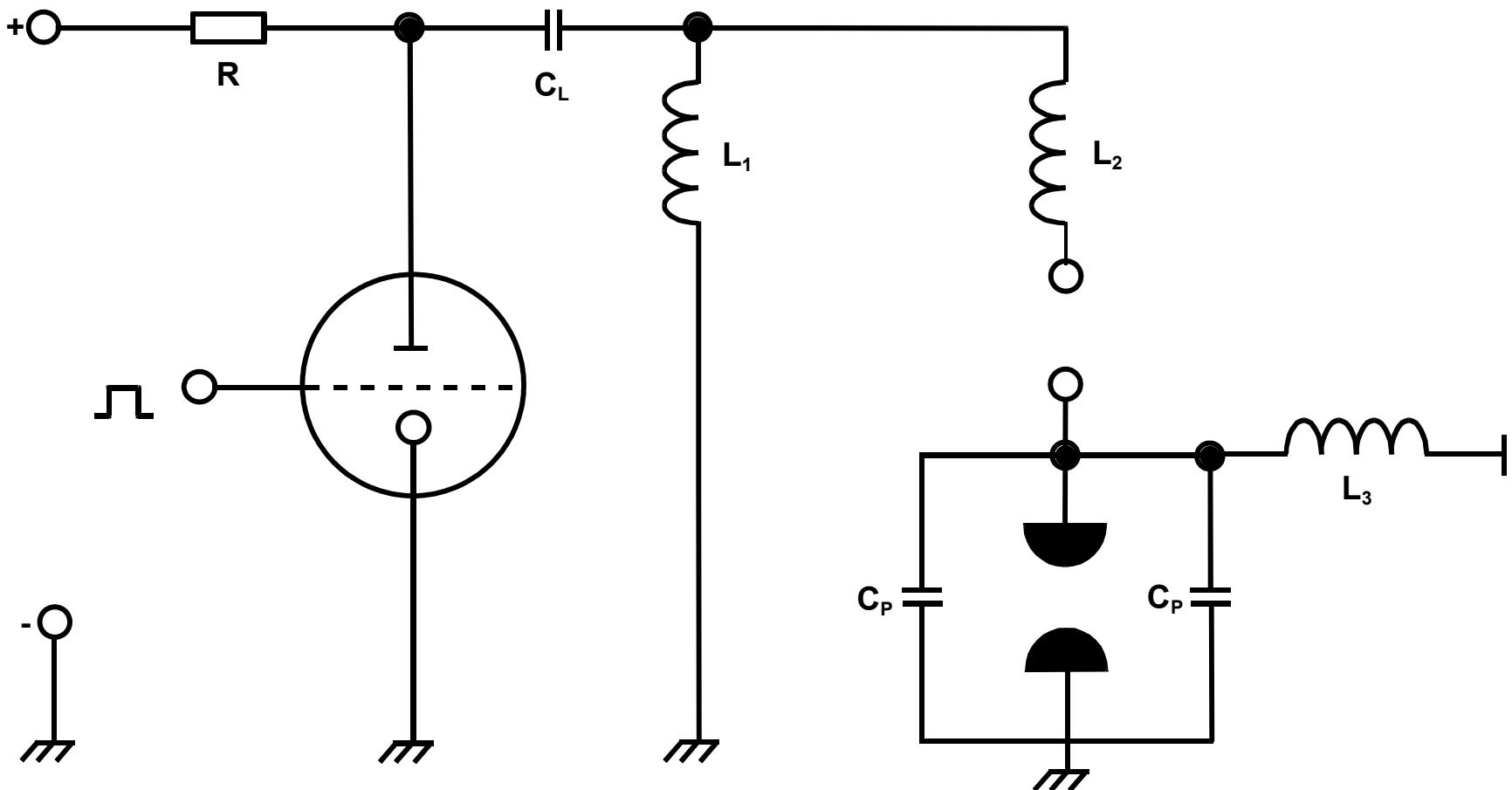


Typical voltages

Heater: 5 - 8V; typ.: 6,3V DC  
Reservoir: 5 - 8V; typ.: 6,3V DC

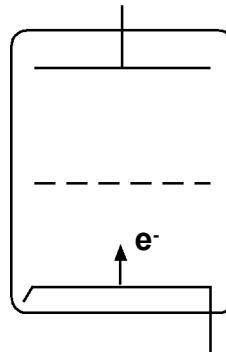


# OPTex – HV-Circuit

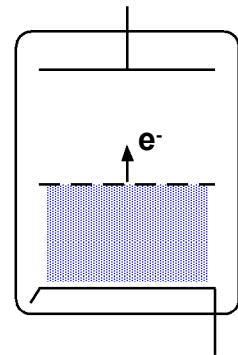


# How Thyratrons Work

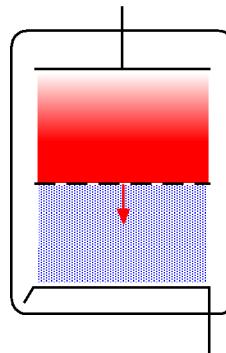
- Negative bias keeps switch open.
- Oxide cathode heated to 750° C.
- Positive trigger pulse of sufficient energy forms a plasma in grid-cathode gap.
- Plasma propagates through grid and causes breakdown of high voltage region between anode and grid (called switching or commutation).
- Further ionization results in complete closure of the switch.
- Typical commutation time is 20 ns.



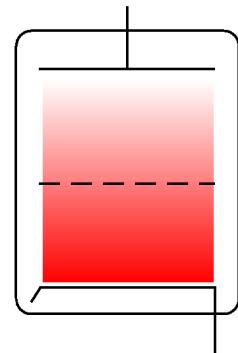
1. Trigger pulse applied to control grid



2. Grid-cathode breakdown

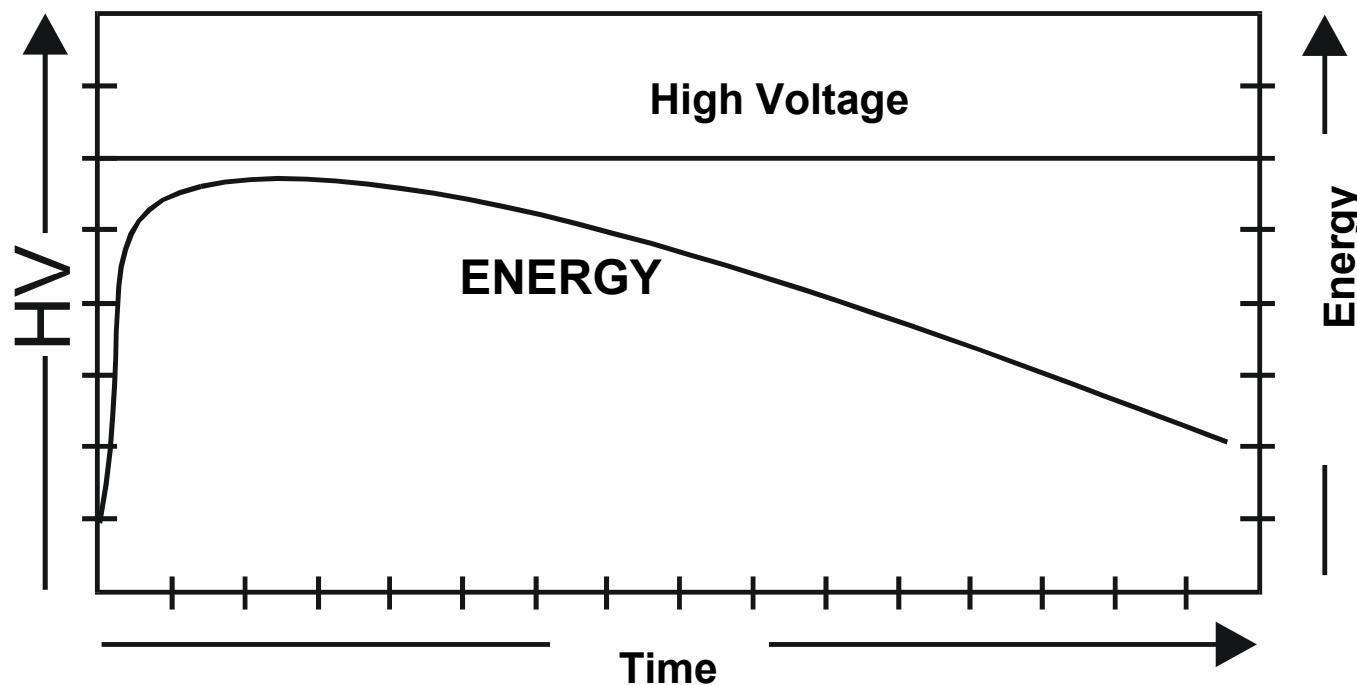


3. Electrons from grid-cathode region create a dense plasma in the grid-anode region. The plasma front propagates toward the cathode via breakdown of gas.

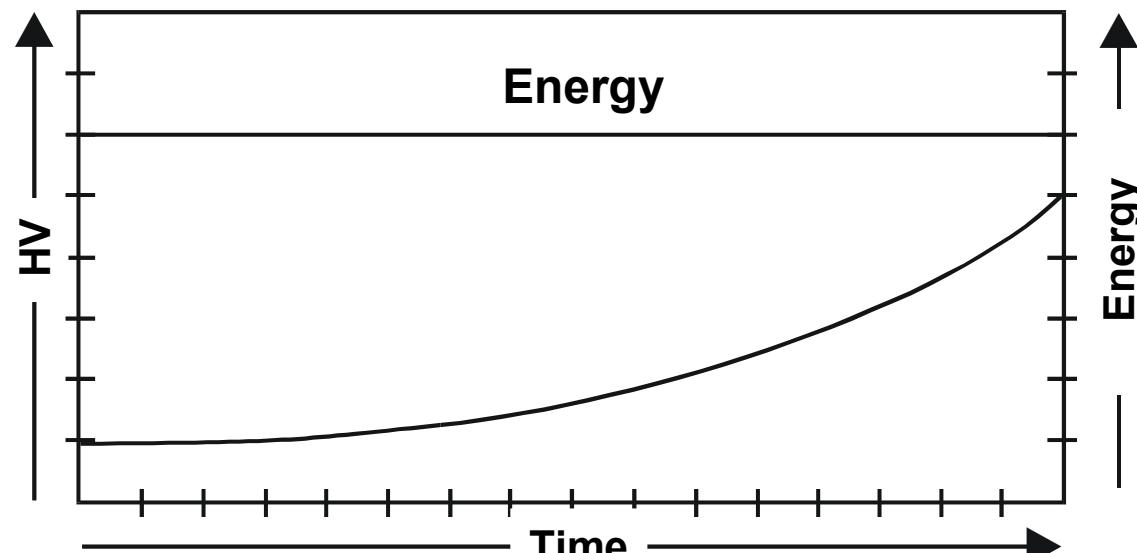


4. Closure

# OPTex® – HV Constant Mode

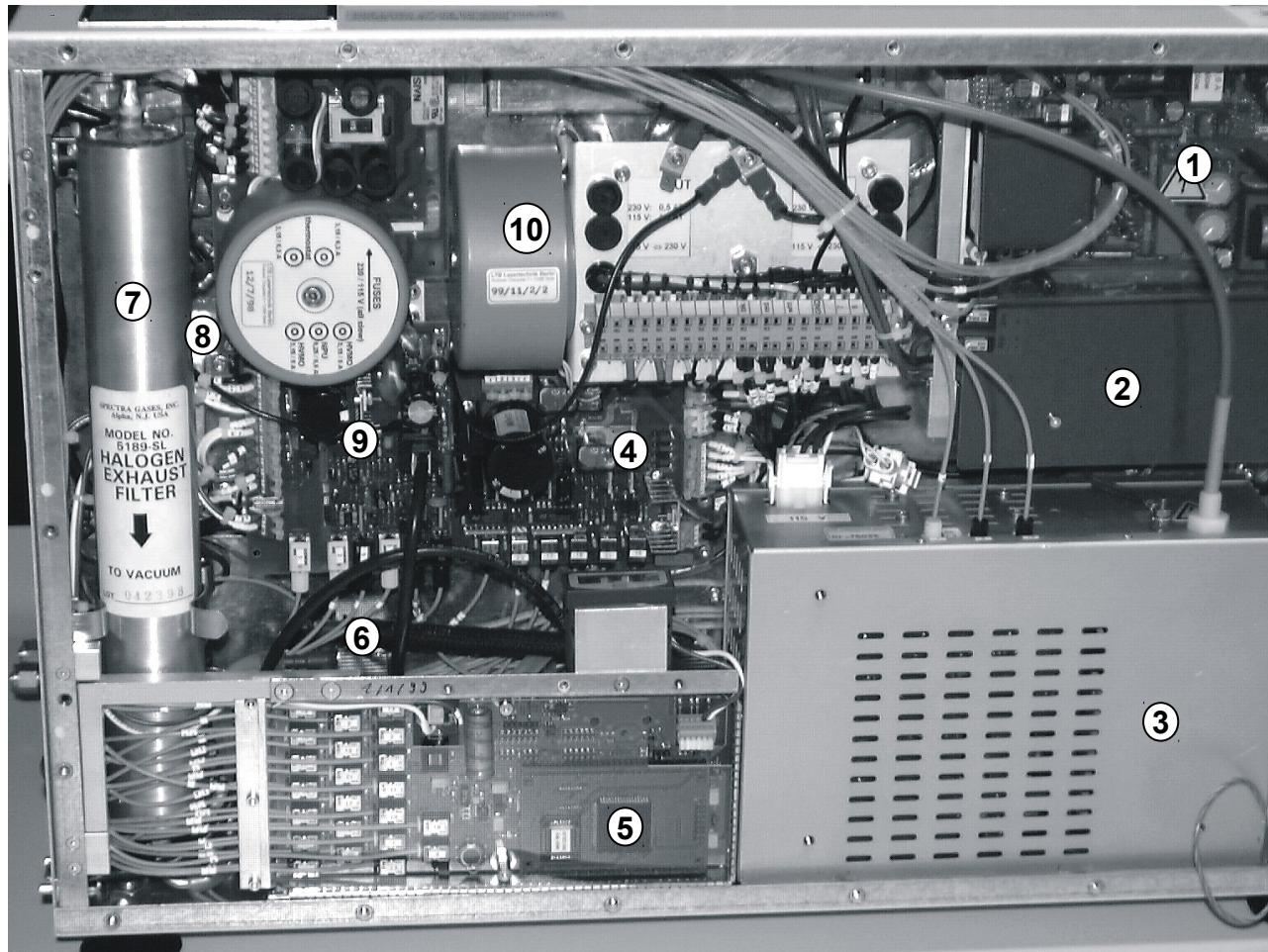


# OPTex® – Energy Constant Mode (Energy Control)



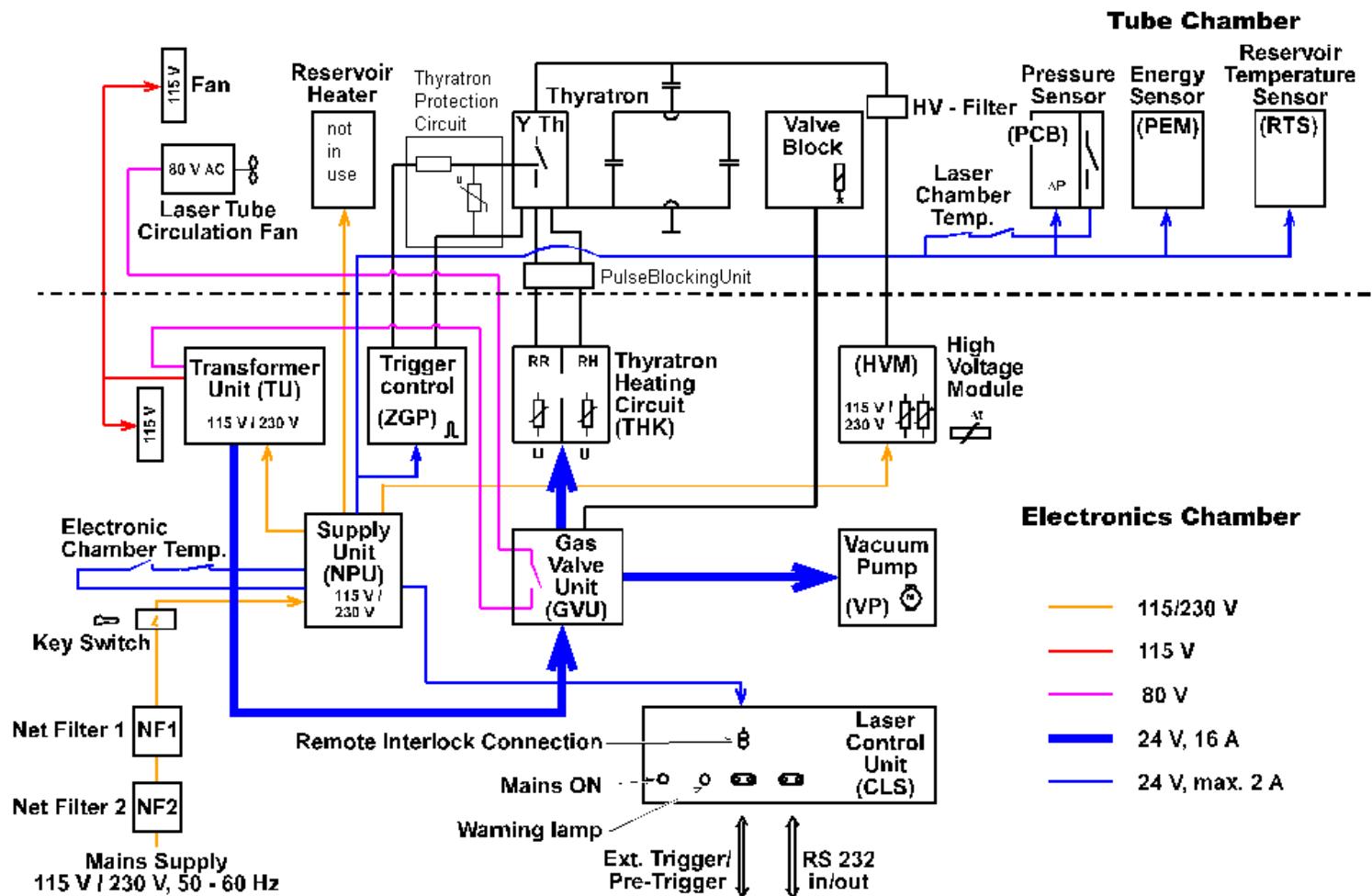
**no gas actions performed**

# OPTex® – Electronics Chamber

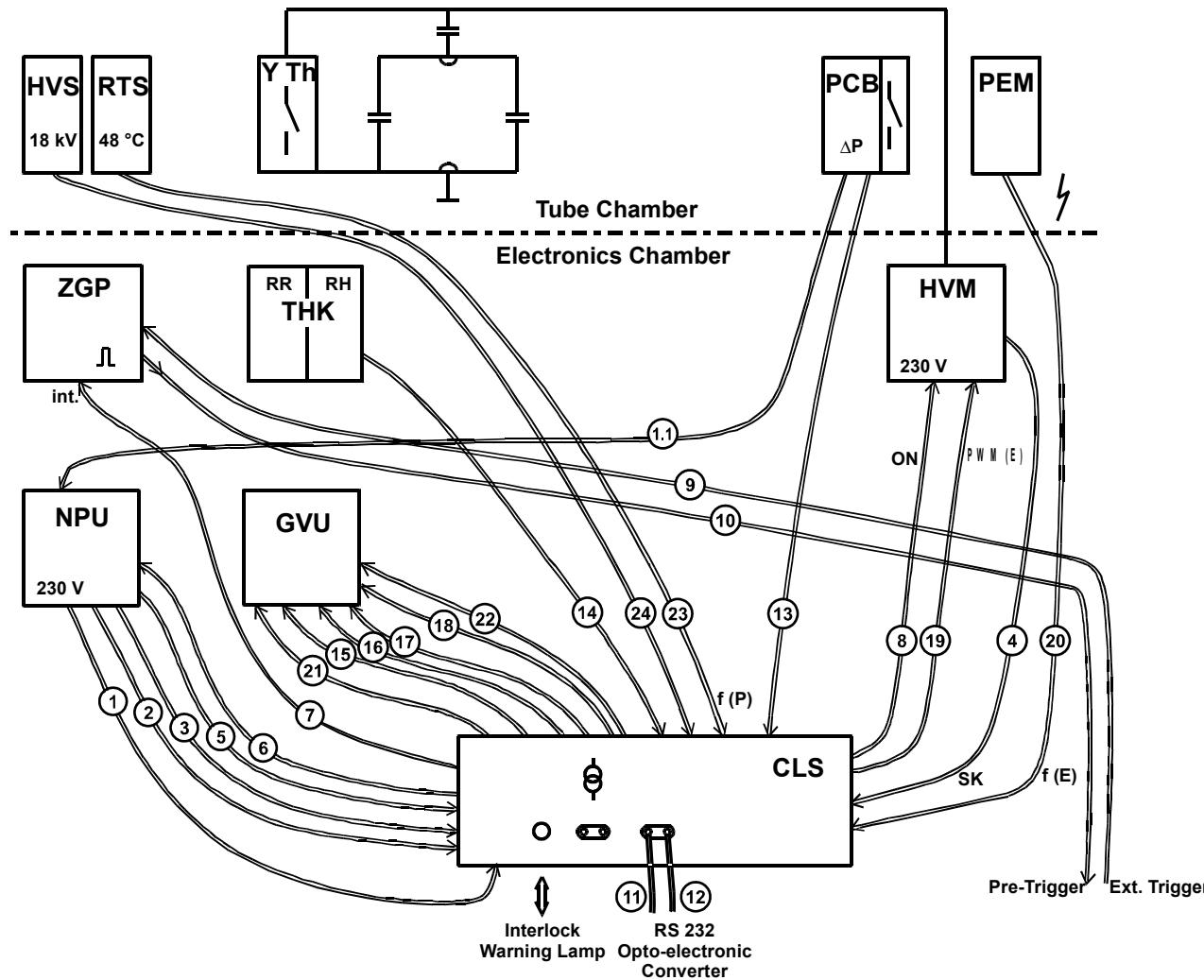


- 1 - Trigger Board**
- 2 - Thyratron Supply Board**
- 3 - High Voltage Module**
- 4 - Gas Handling Unit**
- 5 - Laser Control Unit**
- 6 - Vacuum Pump**
- 7 - Halogen Filter**
- 8 - Mains Filter**
- 9 - Power Supply Module**
- 10 - Transformer Unit**

# OPTEx® – Electric Circuit

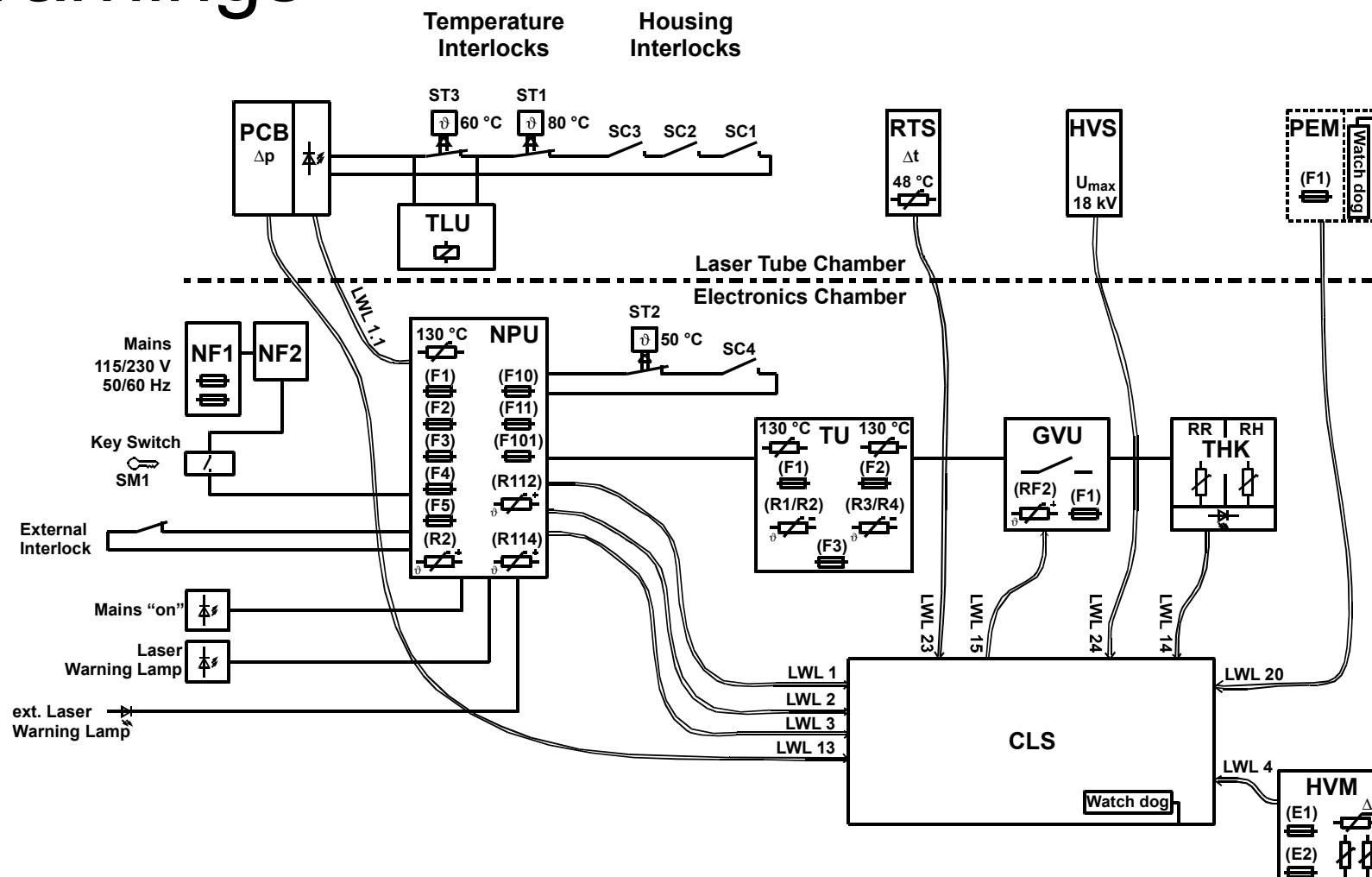


# OPTEx® – Optical Fiber Connections

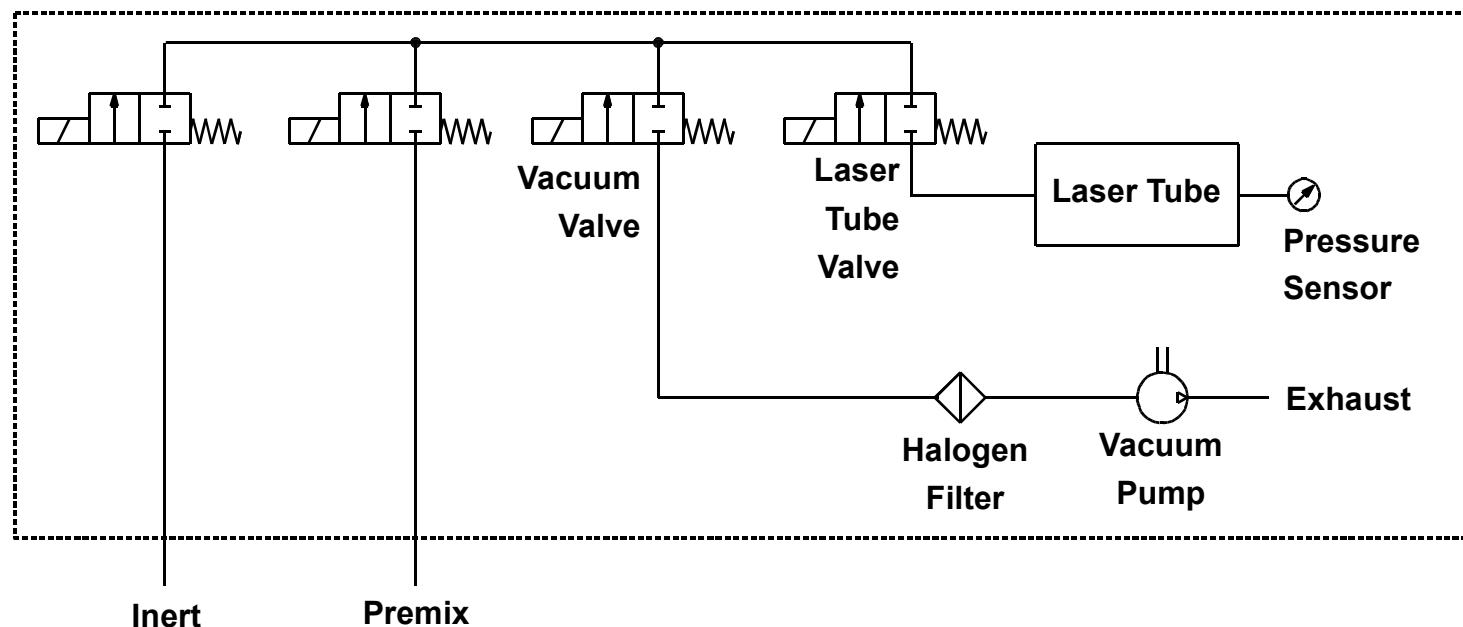


FOL-Nr.	Signal
1	Housing/ Temp. Tube Chamber
1.1	Housing /Temp. Tube Ch. to CLS
2	Interlock
3	Housing / Temp. Electr. Chamber
4	Charge current
5	Warning Lamp
6	Laser ON
7	Internal Trigger
8	HV modul
9	External Trigger „in“
10	Pre-Trigger „out“
11	RS232 - TXD
12	RS232 - RXD
13	Gas Pressure
14	THK supervision
15	GVU enable
16	Vacuum Pump „on“
17	Laser Tube Valve „open“
18	Premix Valve „open“
19	Energy Control PWM
20	Energy measurement
21	Inert Valve „open“
22	Laser Gas Circulation
23	Laser Tube Temperature
24	High Voltage too high

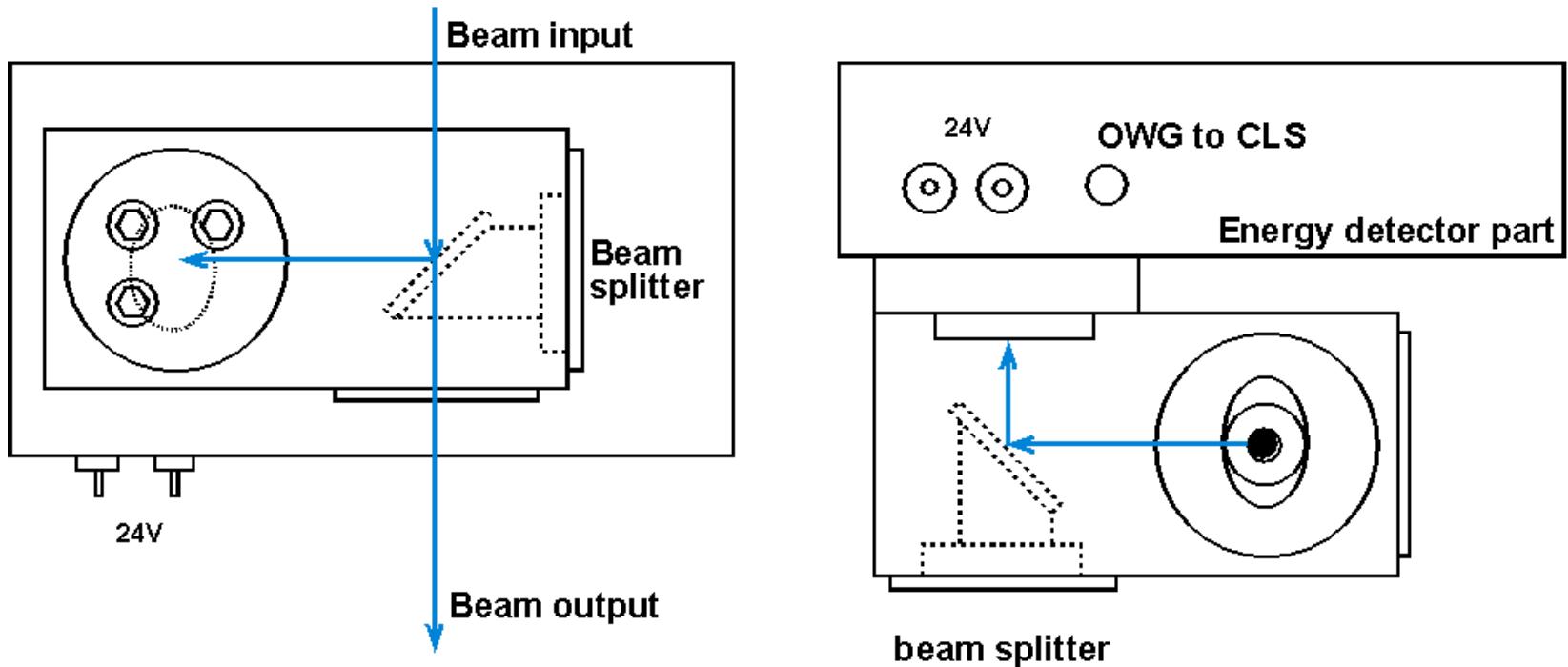
# OPTex® – Safety / Interlocks / Warnings



# OPTex® – Gas Flow Diagram



# OPTEx® – Energy Monitor





**Thanks for your attention !!!!**